§5. Basic Studies of Electric Properties of Polymeric Silver(I) Complexes at Low Temperature

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The chemistry of coordination polymers has attracted much attention as they have potential as functional materials. Recently, a new simplified synthetic procedure for commercial manufacture of ternary single-source precursors (SSPs) to form polycrystalline AgIn*x*S*y* and CuInSe2 type semiconductors.was reported [1]. We reported the preparation of six water-soluble, relatively light-stable, chiral and achiral silver(I) complexes ($_\infty$ {[$Ag_2(ca)_2$]} and $_\infty${[$Ag_2(ca)_2(Hca)_2$]}). Slow evaporation of saturated aqueous solutions of the complexes gave needle single crystals. As shown in Fig. 1, the silver(I) complexes formed linear polymers in the crystal and their Ag-Ag separation indicated the existence of a van der Waals contact between silver(I) atoms.

In attempting to explore electrical properties of these crystalline silver(I) complexes at low temperature, we made test samples for preliminary measurements of electric resistance.

Sample A: Needle crystals of each silver(I) complexes were grown on slide glasses followed by silver paste painting (Fig 2). Electric resistances was estimated as 2.3MΩ at room temperature and 10MΩ at 77K using 0.1μA current source. The esd's of electric resistance were within 10% for three-times repeating, but voltage became larger in the fourth cycle of cooling.

Sample B: Electrodes were prepared by silver paste painting on the slide glasses followed by crystal growth of silver(I) complexes (Fig. 3). The distance of the electrodes was shorted but needle crystals came up from the slide glass.

Future plans: To increase stability of the sample electrodes, test samples using water-insoluble linear silver(I) complexes polymers with shorter distances of electrodes would be made for measurements.

[1] Kulbinder K. Banger, et al, *Inorg. Chem*., 2003, 42, 7713-7715

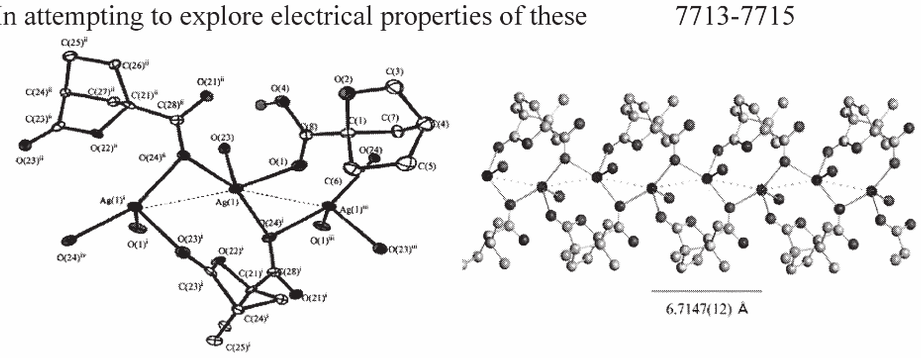

Fig. 1 Molecular structures of the local coordination around the silver(I) centers in the complexes.

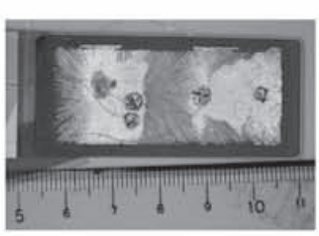

Fig. 2. Sample A

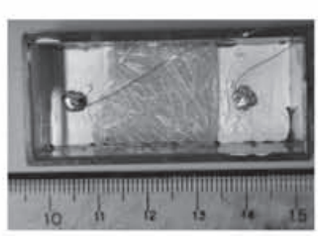

Fig.3. Sample B